

CLAIMS

1. A method of displaying an ultrasound image, comprising:
obtaining a plurality of component image frames of body tissue or fluids;
determining the extent to which at least one portion of each component image frame varies from image frame-to-image frame;
combining a plurality of the component image frames to provide a composite image frame, the number and/or weighting of component image frames that are combined in at least one area of the composite image frame being a function of the determined extent to which at least one portion of each component image frame varies; and
displaying an image corresponding to the composite image frame.
2. The method of claim 1 wherein the act of determining the extent to which at least one portion of each component image frame varies from image frame-to-image frame comprises determining the extent to which a single portion of each component image frame varies from image frame-to-image frame.
3. The method of claim 2, further comprising manually designating the single portion of each component image frame in which the determination is made of the extent to which the single portion of each component image frame varies.
4. The method of claim 3 wherein the act of manually designating the single portion of each component image frame comprises designating the single portion on the displayed image.
5. The method of claim 1 wherein the act of determining the extent to which at least one portion of each component image frame varies from image frame-to-image frame comprises determining the extent to which each of a plurality of portions of each component image frame varies from image frame-to-image frame.

6. The method of claim 1 wherein the act of combining a plurality of the component image frames to provide a composite image frame comprises weighting the contribution that each of the component image frames makes to the composite image frame so that different component image frames contribute to the composite image frame in differing degrees.

7. The method of claim 6 wherein the act of weighting the contribution that each of the component image frames makes to the composite image frame comprises weighting the contribution that each of the component image frame makes based on the lapse in time since the component image frame was obtained.

8. The method of claim 6 wherein the act of weighting the contribution that each of the component image frames makes to the composite image frame comprises weighting the contribution that each of the component image frames makes based on the number of component image frames combined to provide the composite image frame.

9. A method of displaying an ultrasound image, comprising:
obtaining a plurality of component image frames of body tissues or fluids;
dividing each component image frame into a plurality of image areas, each of the image areas in a component image frame representing substantially the same portion of the body tissues or fluids that is represented by a corresponding image area of the other component image frames;
determining the extent to which corresponding image areas of the plurality of component image frames vary from image frame-to-image frame;
combining the corresponding image areas in each of the plurality of the component image frames to provide respective composite image areas in a composite image frame, the number and/or weighting of image areas that are combined to form each of the composite image areas being a function of the determined extent to which the respective corresponding image areas vary; and
displaying an image corresponding to the composite image frame.

10. The method of claim 9 wherein the act of combining the corresponding image areas in each of the plurality of the component image frames to provide respective composite image areas comprises weighting the contribution that each image area in each component image makes to the respective composite image area so that corresponding image areas from different component image frames contribute to the respective composite image area in differing degrees.

11. The method of claim 10 wherein the act of weighting the contribution that each of the image areas in each component image frame makes to the respective composite image area comprises weighting the contribution that each of the image areas in each component image frame makes based on the lapse since the component image frame was obtained.

12. The method of claim 10 wherein the act of weighting the contribution that each of the image areas in each component image frame makes to the respective composite image area comprises weighting the contribution that each of the image areas in each component image frame makes based on the number of component image areas that are combined to form the respective composite image area.

13. An diagnostic ultrasound imaging system, comprising:
an ultrasound scanhead (10) having a plurality of transducer elements;
a transmitter (14) coupled to the scanhead (10) , the scanhead (10) being operable to apply a transmit signal to the scanhead (10);
a beamformer (16) coupled to the scanhead (10), the beamformer (16) being operable to receive signals corresponding to ultrasound echoes from the scanhead (10) and generate a plurality of component image frames corresponding thereto;
a persistence processor (30) coupled to the beamformer (16) to receive signals corresponding to each of a plurality of the component image frames, the persistence processor (30) being operable to determine the extent to which at least one portion of a plurality of the component image frames vary from one image frame to another image frame,

the persistence processor (30) further being operable to combine a plurality of the component image frames to provide a composite image frame, the number and/or weighting of component image frames that are combined by the persistence processor (30) in at least one area of the composite image frame being a function of the determined extent to which at least one portion of a plurality of the component image frames vary;

a video processor (44) coupled to the persistence processor (30), the video processor (44) receiving signals corresponding to the composite image frame and generating from the signals corresponding to the composite image frame corresponding video signals; and

a display (50) coupled to the video processor (44) for receiving the video signal and displaying a corresponding ultrasound image.

14. The diagnostic ultrasound imaging system of claim 13 wherein the persistence processor (30) comprises:

a pre-processor (32) coupled to the beamformer (16), the pre-processor (32) being operable to preweight the signals corresponding to each of a plurality of the component image frames;

a resampler (34) coupled to the preprocessor (32), the resampler (34) being operable to process signals from the preprocessor (34) to spatially realign the component image frames;

a combiner (36) coupled to the resampler (34), the combiner (36) being operable to combine a plurality of the component image frames to provide the composite image frame; and

a post-processor (38) coupled to the combiner (36), the post-processor (38) being operable to normalize signals corresponding to the composite image frame.

15. The diagnostic ultrasound imaging system of claim 14 wherein the pre-processor (32) is operable to preweight the signals corresponding to each of a plurality of the component image frames with a weighting factor that is a function of the number of component image frames that are combined to form the composite image frame.

16. The diagnostic ultrasound imaging system of claim 14 wherein the pre-processor (32) is operable to preweight the signals corresponding to each of a plurality of the component image frames by the age of the component image frames that are combined to form the composite image.

17. The diagnostic ultrasound imaging system of claim 13 wherein the diagnostic ultrasound imaging system further comprises a user interface (20), and wherein the persistence processor (30) comprises:

a digital signal processor (60) coupled to the beamformer (16) and to the user interface, the digital signal processor (60) being operable to receive from the user interface (20) a plurality of processing parameters and to process the signals corresponding to each of a plurality of the component image frames based on the processing parameters;

an image frame memory (62) coupled to receive and store the signals corresponding to each of a plurality of the component image frames; and

an accumulator memory (64) coupled to the digital signal processor (60) and to the image frame memory (62), the accumulator memory (64) being operable to receive from the image frame memory (62) signals corresponding a plurality of the component image frames selected by the digital processor (60) and to store the signals for coupling to the video processor (44).

18. The diagnostic ultrasound imaging system of claim 17, wherein the digital signal processor comprises a frame misregistration system, the frame misregistration system comprising:

a history buffer (102) receiving and storing data indicative of the extent to which at least one portion of the plurality of component image frames vary from one image frame to the next; and

a calculation and decision logic unit (104) coupled to the history buffer (102) to receive the data stored in the history buffer (102), the calculation and decision logic unit (104) being operable to determine based on the data stored in the history buffer (102) the

number of component image frames that should be combined to generate the composite image frame.

19. The diagnostic ultrasound imaging system of claim 13 wherein the persistence processor (30) is operable to determine the extent to which at least one portion of a plurality of the component image frames vary from one image frame to another by determining the extent to which a single portion of each component image frame varies from one image frame to another image frame.

20. The diagnostic ultrasound imaging system of claim 19 wherein the diagnostic ultrasound imaging system further comprises a user interface (20), and wherein the persistence processor (30) is operable to determine the extent to which a single portion of the component image frames varies by manually designating the single portion with the user the user interface (30).

21. The diagnostic ultrasound imaging system of claim 13 wherein the persistence processor (30) is operable to determine the extent to which at least one portion of a plurality of the component image frames vary from one image frame to another by determining extent to which each of a plurality of portions of each component image frame varies from image frame to another image frame.

22. The diagnostic ultrasound imaging system of claim 13 wherein the persistence processor (30) is operable to weight the contribution that each of the component image frames makes to the composite image frame so that different component image frames contribute to the composite image frame in differing degrees.